Cooperative Extension Service

Illinois-Iowa Dairy Guide

University of Illinois at Urbana-Champaign
Iowa State University at Ames

No. 400
September, 1980

08631245

THE TRIGON MILKING PARLOR

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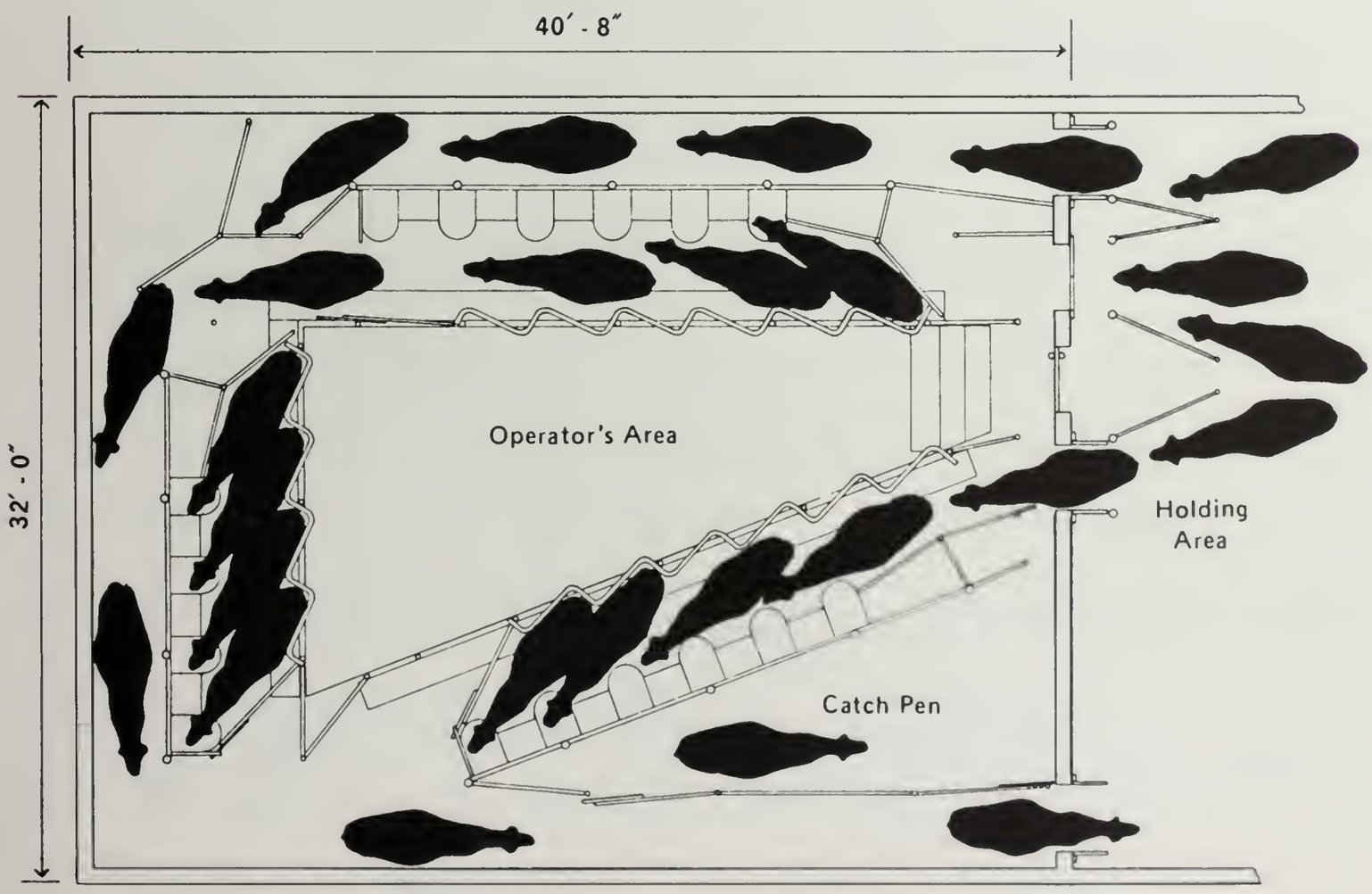
The trigon is a 3-sided milking parlor using herringbone stalls. Three-sided parlors are not entirely new. The U-shaped, side-opening parlor built in the 50's was a trigon parlor. However, a 3-sided parlor utilizing herringbone stalls is a new concept. (Diagram 1)

To date (September 1979), the size of trigons that have been built are 12-, 16- and 18-stall parlors. Trigon parlors of other sizes are being considered. Automation such as power gates, feed bowl covers and detachers is being utilized in varying degrees.

Diagram 1. 16-stall trigon



The first trigon was built in 1977 by dairyman Walter Bartelheimer of Snohomish, Washington. This 12-stall parlor was designed by Gene Gohl, a territory manager for Clay Equipment Company of Cedar Falls, Iowa. The majority of the trigons as of February 1979 have been built in the northwestern states. Gohl's concept for the trigon was taken from a 1971 study of multiple-sided parlor research at Michigan State University. The trigon was designed for the medium-sized dairy (200-500 cows) to incorporate the advantages of the popular 4-sided polygon. Increased performance on a per-stall basis over double-row herringbone parlors is possible because of the decreased effect of slow milking cows on total parlor performance. This is due to three shorter rows of herringbone stalls compared to two longer ones allowing more frequent turn outs. With the trigon a slow milking cow does not delay the milking of as many cows.

PERFORMANCE

Table 1 summarizes the data collected from 12 trigon parlors in northwestern U.S. dairies in 1978-79 from herds with production levels of 42-50 lb. of milk per cow per day. With cows milking more than 50 lb. of milk per day, a decrease of parlor throughput should be anticipated. It will not be as great in trigons, however, as would be experienced in double-row herringbones.

Table 2 is a summary of estimated trigon and herringbone parlor performances with a 60 lb. of milk per cow per day average and a milking time of 7-8 hours with an average operator.

Table 1. Cow throughput in cows per hour* for trigon milking parlors with various mechanization; 42-50 lb. of milk per cow. Data collected in Washington and Oregon 1978-79.

Mechanization	12-Stall	16-Stall	18-Stall
	Cows per hour (Number of operators milking)		
None	64-80[4]* (2)	—	—
Feed bowl covers	72[1] (2)	—	—
Detaching units	66-70[2] (1)	—	—
Feed bowl covers & detaching units	70-76[2] (1)	70-93[2] (1)	94[1] (1)

*Steady-State throughputs. Parlor setup, cleanup and changing groups not included.

*Number of parlors.

Table 2. Estimated performance* for milking parlors with various components of mechanization*.

	Herringbone				Trigon			
	Number of Stalls				Number of Stalls			
	8	12	16	20	12	16	18	22
	cows per hour (number of operators)							
None	37 (1)	60 (2)	72 (2)	82 (2)	70 (2)	80 (2)	88 (2)	94 (2)
Feed bowl covers	39 (1)	62 (2)	74 (2)	84 (2)	76 (2)	86 (2)	94 (2)	100 (2)
Detaching units	37 (1)	55 (1)	64 (1)	70 (1)	60 (1)	70 (1)	78 (1)	84 (1)
Feed bowl covers & detaching units	39 (1)	57 (1)	67 (1)	73 (1)	66 (1)	76 (1)	84 (1)	90 (1)
Feed bowl covers, detaching units & crowd gate	41 (1)	60 (1)	70 (1)	76 (1)	70 (1)	80 (1)	88 (1)	94 (1)

*Steady-state throughputs. Parlor setup, cleanup and changing groups not included.

*Cows milking 60 lb. milk/day, average efficient operator and 7-8 hours of continuous milking.

Data from operator's performance, as summarized in Table 3, would indicate the operator has sufficient time to perform all milking duties. In addition, the idle & adjustment time of 16 to 43% of the total milking time would indicate quality of milking has not been sacrificed for speed or efficiency. This data would also indicate that a trigon larger than 18 stalls may be feasible. A 22-stall trigon (8-8-6) could be constructed in a building the same width as an 18-stall (6-6-6).

Table 3. Operator's performance in trigon parlors. Northwestern United States - 1978-79.

	Parlor Size			
	12-Stall No. mech. 2 op.	12-Stall Pow. gates & det. 1 op.	16-Stall Partial mech.* 1 op.	18-Stall Partial mech.* 1 op.
	sec/cow (%)	sec/cow (%)	sec/cow (%)	sec/cow (%)
Entrance	3.2 (4)	3.7 (8)	3.5 (9)	4.3 (11)
Preparation	13.3 (15)	21.4 (44)*	6.2 (16)	7.6 (20)
Machine attach	8.5 (9)	8.4 (17)	8.8 (22)	10.5 (27)
Machine strip & detach	23.4 (25)	—	—	—
Teat dip	2.0 (2)	2.0 (4)	—	1.8 (5)
Exit	3.2 (4)	5.4 (11)	4.2 (10)	6.1 (16)
Idle & milking machine adjustment time	38.1 (41)	7.7 (16)	17.1 (43)	8.0 (21)
Total seconds/cow	91.7	48.6	40.0	38.3
Cows milked per unit per hour	6.67	6.17	5.63	5.22
Cows per manhour	40	74	90	94

*Cows were extremely dirty.

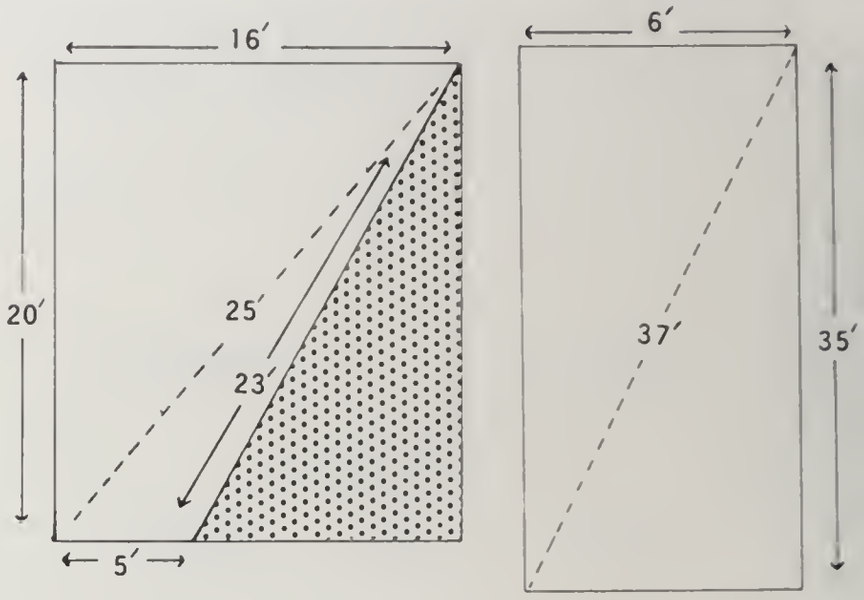
*Partial mechanization includes crowd gate, power gates, feed bowl covers and detachers.

The operator's ability to see and recognize problems such as machine dropoff or teat cup slippage is improved with the 3-sided parlor. The improved environment of a wider and more open pit area on the operator's attitude is evident but cannot be measured quantitatively. The walking distance around the perimeter of the milking pit is less (Diagram 2) for a 12-stall trigon than for a double-8 herringbone with comparable performance (70 cows/hour).

To correct a milking machine malfuntion the distance from the furthest points is less for a trigon than a herringbone with comparable performance; approximately 25 ft for the trigon and 37 ft for the double-8 herringbone (Diagram 2). Malfunctions occur at the rate of approximately 8 per 100 cow milkings under normal milking conditions.

The majority of the existing trigons have been built utilizing the space (shaded) on the angle side of the parlor (Diagram 2) as a holding pen for problem cows sorted out during milking time. Cows can be sorted without the milker leaving the operator's pit, thus, increasing parlor performance. An alternate design of the trigon could be to reverse the triangle and put the flat side next to the holding pen (Diagram 3). Another advantage of this design would be that the operator's work area would be smaller because all 12 cows' udders are in a smaller area. Another design possibility could be direct access to the milk house if return lanes were located on both sides of the parlor.

Diagram 2. Perimeter Distance and Milking Pit.

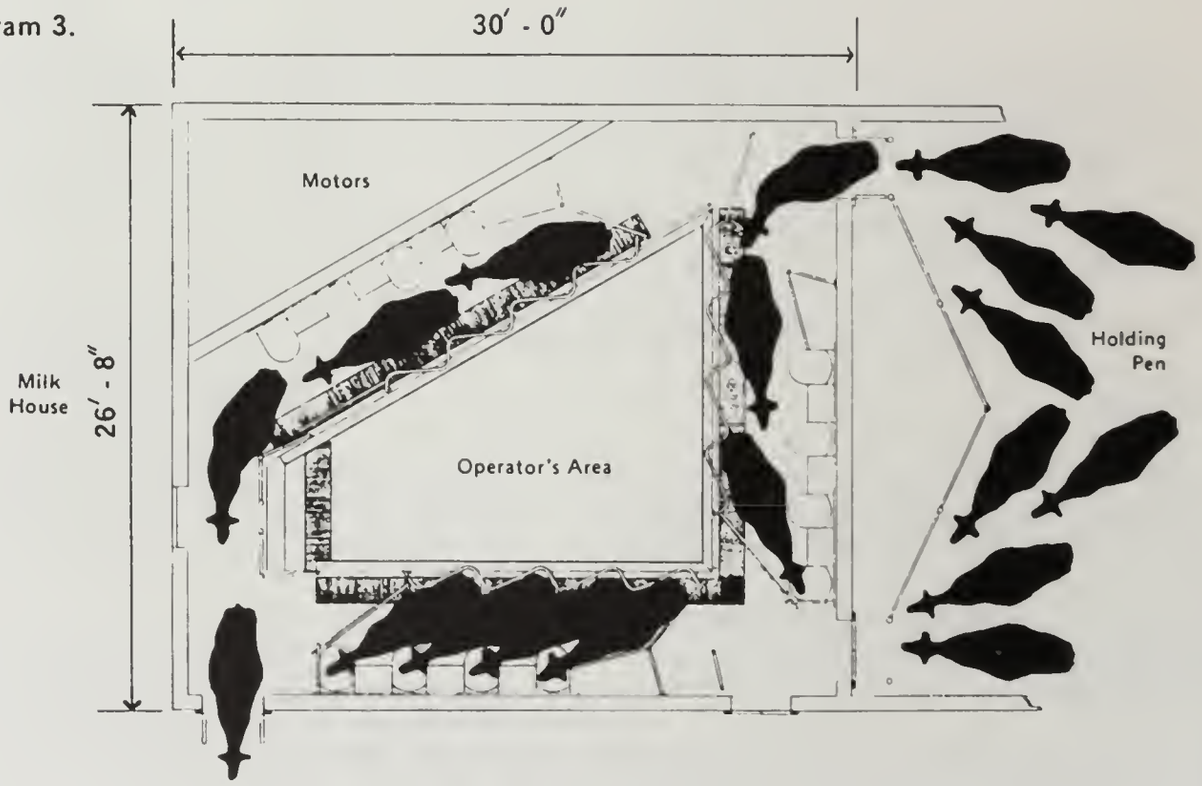


12-stall Trigon (70 cows per hour)[a]
Perimeter distance - 64′

Double-8 herringbone (70 cows per hour)[a]
Perimeter distance - 82′

[a]Parlor equipped with crowd gate, power gate, feed bowl cover and detachers with one operator.

Diagram 3.



ANNUAL MILKING COST:

A lower annual milking cost per cow is possible with a trigon when compared with a herringbone of equal stall numbers because of greater parlor efficiency. Table 4 compares the trigon and herringbone parlors. For example: A $4 per cow per year lower annual milking cost per cow is possible with a 200-cow herd when a trigon and herringbone with 12 stalls is compared. A dairyman milking 500 cows would have a $3,500 lower annual milking cost when comparing a 16-stall trigon and a 16-stall herringbone.

Table 4. Annual milking cost per cow 1979-80*.

Parlor Type	[cows per hour steady state]	Mechanization	No. of Milking Cows 100	200	300	400	500
			$/cow (hours milking)[a]				
Double 6	[60]	Partial[b] (1 man)	337 (3.0)	204 (4.8)	162 (6.8)	140 (8.7)	
Trigon 12	[70]	Partial (1 man)	333 (2.7)	200 (4.4)	153 (6.0)	130 (7.7)	
Double 8	[70]	Partial (1 man)		220 (4.4)	168 (6.0)	143 (7.7)	128 (9.4)
Trigon 16	[80]	Partial (1 man)		215 (4.0)	163 (5.5)	137 (7.0)	121 (8.5)
Double 10	[76]	Partial (1 man)		236 (4.1)	178 (5.7)	149 (7.3)	131 (8.8)
Trigon 18	[88]	Partial (1 man)		233 (3.8)	174 (5.2)	144 (6.6)	125 (7.9)

* Annual cost based upon: depreciation of 12 years for building, 7 years on all equipment, insurance $5.80 per $1,000, repairs at 2.5% for parlor, 6% on equipment and 8% on mechanization, labor $14,500, 11% interest.

[a] Hours of milking includes parlor setup (30 min.), cleanup (30 min.) and 15 minutes per 100 cows for changing groups.

[b] Partial mechanization includes power gates, feed bowl covers, crowd gate and detachers.

CONCLUSION:

1. Trigon milking parlors are more efficient than double-row herringbones when cow throughput (cows per hour) is the standard of measurement.

2. Trigon milking parlors have a lower annual milking cost than herringbone parlors with the same number of milking stalls.

ACKNOWLEDGMENTS

This study was made possible by a grant from Clay Equipment Company, Cedar Falls, Iowa and Regional Research Project, NC-119, Improving Large Dairy Herd Management Practices.

The author is grateful to the Dairymen of Washington, Oregon and British Columbia and Grady F. Williams, Washington State Extension Dairyman, for their cooperation in data collection.

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Issued in furtherance of Cooperative Extension work, Acts of Congress of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture and Cooperative Extension Service in Illinois and Iowa.

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